TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE WYOMING SOIL CONSERVATION SERVICE

Biology No. 230 January 1986

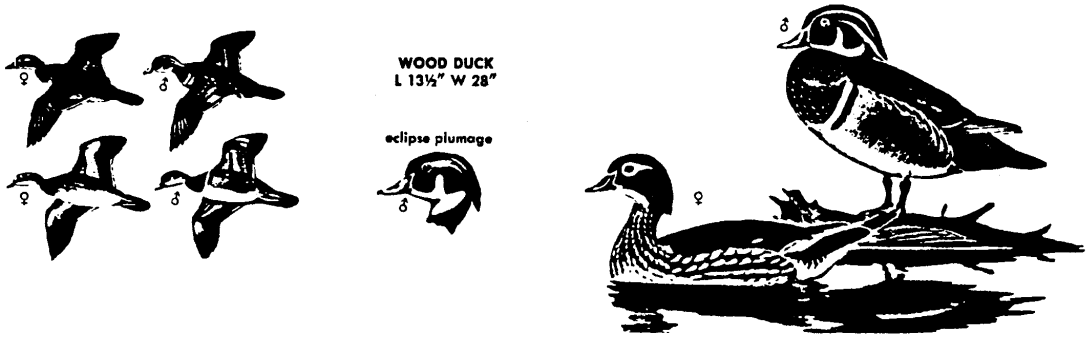
Subject: WOOD DUCK*

General

Wood ducks (Aix sponsa) inhabit creeks, rivers, floodplain lakes, swamps, and beaver ponds. The major breeding range of the wood duck is in the eastern United States from Florida and east Texas north to Maine and North Dakota and north into the eastern Canadian provinces. A Pacific population breeds from British Columbia south to California and east to Montana. The major wintering range occurs south of Maryland in the Atlantic and Gulf Coast States, as well as Arkansas and Tennessee. The majority of the Pacific population winters in the Sacramento Valley. Wood ducks are permanent residents in the southern half of their breeding range.

Food Requirements

Wood ducks have been referred to as primarily herbivorous, although recent studies have indicated that invertebrates make up a significant part of the annual diet. Wood ducks forage on the ground or in water at depths up to 46 cm (18 inches). In Missouri, they foraged primarily in flooded timber during spring and fall. The daily foraging radius in the southeastern United States may be as much as 40 to 48 km (25 to 30 mi). Food items include mast and fruits, aquatic plants and seeds, insects, and aquatic invertebrates. Acorns and other mast are important fall



Prepared by: Richard Rintamaki, State Biologist

State Resource Conservationist

*Information taken from Ecoregion M3113 Handbook and Habitat Suitability Index Models, Wildlife Species Narratives (literature searches), U.S. Fish and Wildlife Service, various dates between 1978-1984.

and winter foods. When acorns are lacking, other important foods include the seeds of baldcypress (Taxodium distichum), hickories (Carya spp.), buttonbush (Cephalanthus occidentalis), arrowarum (Peltandra virginica), and burreed (Sparganium spp.). Important fall foods of wood ducks in Maine were

pondweeds (Potamogeton spp.), burreeds, water bulrush (Scirpus subterminalis), oaks, and wild rice (Zizania aquatica). Wood ducks prefer to forage for mast in areas of shallow water, although they may also forage on the forest floor and even on tree limbs before the mast has fallen. Important foods during the breeding season include persistent overwintering fruits; corn and other domestic grain; seeds and fruits from bottomland hardwood trees, shrubs, and aquatic herbaceous plants; early spring plants; and invertebrates.

Female wood ducks have high protein and calcium requirements in the spring and feed heavily on aquatic invertebrates. They satisfy their protein requirements for egg laying through their diet rather than through internal stores. Invertebrates made up about 82 percent by volume of the diet of wood duck hens in Missouri during the laying period. During incubation, when protein requirements were reduced, 58.5 percent of the diet of the hens was plant foods. Drakes did not exhibit the same pattern of invertebrate use, indicating that hens feed selectively on invertebrates during the egg laying period. The abundance and availability of macroinvertebrates to wood duck hens during the pre-breeding period is critical to successful reproduction. Invertebrates made up about one-third of the fall diet of drakes and hens and the spring diet of drakes.

Ducklings less than 1 week old are dependent on animal foods (primarily insects) and forage in areas where both food and some protective cover are present. The diet of ducklings is similar to that of adults by 6 weeks of age.

Water Requirements

No information on dietary water needs of the wood duck was found in the literature. However, water needs are likely satisfied in wetland habitats used by the wood duck. The remainder of this section describes those water characteristics that influence habitat use by wood ducks.

Water depth affects the quantity, variety, and distribution of cover and food, and wood duck needs are generally met between the shoreline and a water depth of 1.8 m (6 ft). However, even when wood ducks feed :in deeper water, the actual feeding depth is generally restricted to the top 30 cm (12 inches) of water. Water is critical in wood duck breeding and brood-rearing habitat from mid-January to late September in the southern United States and from mid-April to late September in the northern portions of the range. Water in most of the breeding habitat should be from 7.5 to 45 cm (3 to 18 inches) deep, still or slow-moving, and sheltered from the wind. Areas with water less than 30 cm (12 inches) deep are especially important in providing invertebrate foods for breeding wood ducks. A water current of 4.8 km/hr (3 mph) has been estimated as the maximum tolerable streamflow for breeding wood

ducks, although broods seldom use areas with currents greater than 1.6 km/hr (1 mph). Isolated wetlands much less than 4 ha (10 acres) in size are considered marginal brood-rearing habitat. The more shoreline per unit area of water, the more suitable the habitat, provided the distance between opposite shores is at least 30 m (100 ft).

Cover Requirements

Suitable cover for wood ducks may be provided by trees or shrubs overhanging water, flooded woody vegetation, or a combination of these two types. A ratio of 50 to 75 percent cover to 25 to 50 percent open water is preferred in breeding and brood-rearing habitat. Adult molting habitat is similar to brood habitat, although molting adults make greater use of herbaceous wetlands dominated by cattails and bulrushes.

An abundance of downed timber provides suitable year-round cover. Young trees and mature shrubs with low overhead and lateral growth provide optimal cover for breeding adults. Ideal shrub cover is provided by shrubs that form a dense canopy about 0.6 m (2 ft) above the water surface. The deciduous forested types used by breeding wood ducks vary throughout their range, although wooded areas that are flooded in early spring are the most suitable nesting habitat. One study lists the following as the most important habitats for nesting wood ducks: Southern floodplain forests; red maple (Acer rubrum) swamps; Central floodplain forests; temporarily flooded oak-hickory forests; and Northern bottomland hardwoods. Buttonbush is an important source of cover for wood ducks throughout much of their range.

Winter-persistent emergents that have a life form similar to shrubs, such as cattail (Typha spp.), soft rush (Juncus effusus) , bulrush (Scirpus spp.), burreed, purple loosestrife (Lythrum salicaria), and phragmites (Phragmites communis) may satisfy cover requirements where more desirable shrubs and trees are not available.

Wood duck brood cover is provided by a combination of downfall and woody and herbaceous emergent plants, well interspersed with small, open water channels. In the Mississippi Alluvial Valley, broods less than 2 weeks old typically use flooded lowland forests in order to satisfy their requirements for invertebrate foods. Wood ducks older than 2 weeks of age use habitats dominated by buttonbush. Wood duck broods in Massachusetts preferred areas with dense cover interspersed with small open pools, clumps of buttonbush, and muskrat houses. Buttonbush clumps and muskrat houses provided loafing sites out of the water. Optimal composition in brood habitat consists of 30 to 50 percent shrubs, 40 to 70 percent herbaceous emergents, 0 to 10 percent trees, and 25 percent open water. Shrubs and/or clumped herbaceous vegetation may provide cover in areas where downed timber is not available. South Carolina beaver ponds that provided both shrubby and herbaceous cover received greater use by wood duck broods than ponds dominated by either shrubs or herbaceous vegetation. Shrubs provide cover, security, and loafing sites, while herbaceous vegetation provides cover and habitat for invertebrates that make up a major

portion of the diet of ducklings. Emergent herbaceous vegetation that does not provide any early spring cover, especially in pure stands, does not provide much suitable brood cover. An abundance of downed trees in shallow water [up to 0.9 m (3 ft) deep] provides excellent brood-rearing cover and "...is particularly important for early broods hatching before leaves appear on trees and shrubs and before the appearance of emergent plants."

Emergent plants used for brood cover vary with latitude, but include smartweeds (Polygonum spp.), American lotus (Nelumbo lutea), pickerelweed (Pontederia cordata), bluejoint (Calamagrostis canadensis), arrowheads (Sagittaria spp.), soft rush, spatterdock (Nuphar luteum), arrowarum, and clump sedges (Carex spp.). Other important herbaceous plants are water primrose (Jussiaea spp.), reed canarygrass (Phalaris arundinacea) , cattail, burreed, swamp loosestrife, and grasses.

Wood duck broods and breeding pairs require loafing sites scattered throughout their habitat for preening and sunning. The best loafing sites are surrounded by water, have good visibility, and are near escape cover. Loafing sites should be at least 45 by 45 cm (18 by 18 inches) in size and 5 to 15 cm (2 to 6 inches) above water. Optimal habitat contains 10 to 20 loafing sites (muskrat mounds, stumps, logs, small islands, and tussocks) per 0.4 ha (1 acre). Shorelines and points of land that are relatively bare of vegetation are marginal substitutes for more optimal loafing sites. The lack of suitable loafing sites may be a limiting factor in brood use.

Wood duck broods in South Carolina used small ponds (0.03 to 0.50 ha; 0.07 to 1.2 acres) significantly more often than larger ponds (1.51 to 3.80 ha; 3.7 to 9.4 acres).

Shrub swamps dominated by buttonbush were preferred as fall roost sites in southern Illinois over flooded forested habitats and open water. One such roost of 200 ha (494 acres) consisted of 60 percent buttonbush cover and 40 percent open water. Another fall roost site was dominated by American lotus and another one was dominated by water willow (Decodon verticillatus).

Ideal winter habitat consists of a complex of wetlands centered on a permanent wetland. Optimum winter habitat includes scrub/shrub wetlands, emergent wetlands, dead timber, and flooded forests.

Reproductive Requirements

The distribution of breeding populations of wood ducks is closely related to ". ..bottomland hardwood forest with trees of sufficient size to contain usable nest cavities and water areas that satisfy food and cover requirements." Important limiting factors include the availability of suitable nesting cavities and the availability of protein foods for pre-breeding females. Hens are most easily able to satisfy their protein requirements in flooded lowland forests where flooding dynamics create a highly productive invertebrate food base. In the Mississippi Alluvial Valley, 1 ha (2.47 acres) of properly flooded

forest can provide enough protein foods to support 800 wood ducks for 1 day. If it is assumed that a hen will use a flooded forest habitat for 60 days during the pre-breeding and nesting periods, then 1 ha (2.47 acres) of properly flooded forest can support about 13 hens (or 5 hens/0.4 ha [1.0 acre]) during the 60-day use period. A ratio of 8 ha (20 acres) of nesting habitat to every 0.4 ha (1 acre) of brood habitat is recommended for maximum production in areas where natural cavities provide the only potential nest sites. However, this ratio is based on: (1) the presence of at least one suitable cavity/2 ha (5 acres); and (2) the carrying capacity of each 0.4 ha (1.0 acre) of brood habitat being sufficient to accommodate broods produced by four nest cavities.

The closer the nest cavity to water, particularly to suitable brood habitat, the better. Cavities in trees in or near the water are preferred. Most wood duck nests in tree cavities in Massachusetts were located within 183 m (200 yds) of water. Wood ducks nesting in tree cavities in Minnesota selected cavities that were significantly closer to water and to canopy openings than were randomly sampled trees. Nest trees ranged from 0 to 350 m (0 to 383 yds) from water and averaged 80 m (87.5 yds). Twenty-one of 31 nest trees selected by radio-marked hens were within 0.5 km (0.31 mi) of permanent water, while eight nests were farther than 1.0 km (0.62 mi) from permanent water. Artificial nest sites in wooded areas are best located within 0.4 km (0.25 mi) of water, but nest boxes located up to 1.6 km (1 mi) from water may also receive use. Nest boxes placed within 1.4 km (0.86 mi) of brood habitat in a Florida study area received significantly greater use than those placed farther away.

Wood ducks generally nest in tree species that have a mature size of at least 35 to 40 cm (14 to 16 inches) dbh and a long life expectancy. The minimum-sized tree used for nesting in Minnesota was 28 cm (11 inches) dbh. Overmature and decadent trees usually contain the largest number of suitable cavities. Conifers and dead trees, other than cypress, rarely provide suitable cavities. The most suitable cavity trees range from 60 to 90 cm (24 to 36 inches) dbh. Natural cavities used for nesting by wood ducks in Massachusetts ranged from 33.0 to 91.4 cm (13 to 36 inches) dbh with a mean dbh of 68.6 cm (27 inches).

Acceptable nest cavities in trees are at least 2 m (6 ft) above ground, have an entrance size of 9 to 30.5 cm (3.5 to 12 inches) in diameter, and a depth of 15 to 120 cm (6 to 48 inches). Optimal tree cavities have an entrance size of 10 cm (4 inches) in diameter, a diameter at the bottom of 25 to 27.5 cm (10 to 11 inches), a cavity depth of 60 cm (24 inches), and are 6 to 15 m (20 to 50 ft) above ground. One study suggested that the optimum cavity height of 6 to 15 m is simply where most suitable cavities form in trees rather than an expressed preference by nesting wood ducks. However, one study found an increasing index of use (i.e., use compared to availability) with increasing cavity height. A suitable cavity must drain well and preferably has its entrance protected from the weather. Cavity trees in southeastern Missouri were defined as all trees at least 24.1 cm (9.5 inches) dbh that contained at least one cavity with an entrance size of at least 6.4 by 8.9 cm (2.5 by 3.5 inches). Suitable cavities were

those of adequate dimensions that did not have adverse features, such as water or excessive debris in the cavity or open tops above the cavity. A total of 109 cavity trees were found in three cover types, and 17 were judged to contain suitable cavities for wood ducks, a ratio of 1 suitable cavity to 6.4 cavity trees. A suitable cavity on two study areas in Massachusetts was defined as having a minimum entrance size of 6.4 by 8.9 cm (2.5 by 3.5 inches) and being within 0.8 km (0.5 mi) of water. Results were 1 suitable cavity/5.3 cavity trees (13 suitable out of 69 cavities) on one study area and 1 suitable cavity/4 cavity trees (9 suitable out of 36 cavities) on the second area.

The density of suitable cavities on two Massachusetts study areas was 2.5/2.59 km2 (1 mi2) and 0.6/2.59 km^2 (1 mi^2), although the estimates were based on total study area size rather than on timbered area only. The density of suitable cavities in timbered bottomland in Iowa was 1/9.7 ha (24 acres). In Illinois, suitable cavities were defined as those with an entrance diameter of at least 8.9 cm (3.5 inches) and that were free of water or debris. One suitable cavity/5.3 ha (13 acres) was found in bottomland forests, and 1 suitable cavity/ 2.0 ha (5 acres) was found in upland woodlots. The density of suitable cavities (defined above) in three timber types in Missouri ranged from 1/1.4 ha (3.4 acres) to 1/4.2 ha (10.3 acres) and averaged 1/2.1 ha (5.2 acres) of forested habitat. The highest reported density of suitable cavities [defined by an entrance diameter of at least 10 cm (3.9 inches)] was 4/ha (1.6/acre) in mature northern hardwood and mature aspen forests in Minnesota.

Interspersion Requirements

The best wood duck habitat is characterized by nest sites in close. Proximity to brood habitat. However, wood duck broods in North Carolina moved 2.4 km (1.5 mi) from a nesting pond to a shrub thicket marsh for brood rearing. Although most of the movement was along a watercourse, overland travel of 0.16 km (0.1 mi) was required from the nesting pond to the river used for the major part of the movement. Wood duck hens and broods in Minnesota traveled overland up to 3.9 km (2.4 mi) from nest site to brood habitat. Wood duck broods in east-central Texas moved up to 11.7 km (7.7 mi) to brood habitat from nest sites located in areas without brood habitat, although overall brood survival was only 8 percent. Management of forests for wood duck nesting cavities greater than 0.8 km (0.5 mi) from brood habitat is generally not recommended.

One study reported a survival rate of hatched ducklings to flight stage of 53 percent (9.8 ducklings/brood at hatch; 5.2 ducklings/brood reaching flight stage). Another study accounted for the loss of total broods and concluded that wood duck hens successfully raised 41 percent of the total ducklings hatched.

Wood ducks do not maintain stable home ranges, and both the size and shape of their home ranges are flexible. The total home range utilized by broods in South Carolina varied from 0.77 to 29.6 ha (1.9 to 73.1 acres). Movements from fall roosts in Illinois ranged up to 10 km (6.2

mi), although most movements were within 2.2 km (1.4 mi) of the roosts. Areas of activity during the fall ranged from 23.9 to 186.2 ha (59 to 460 acres) and average 90.6 ha (224 acres). Most activity of nesting hens in Minnesota was within 1.0 km (0.6 mi) of the nest site, suggesting that a pair may use an area of approximately 3.0 km^2 (1.6 mi^2).

Special Considerations

In areas where natural cavities are lacking or limiting, artificial nest boxes can be used to increase breeding populations. The most important factors limiting wood duck breeding populations are availability of and competition for suitable cavities, predators, and food. A nest box program that provides predator-proof nesting cavities can minimize the effects of the first two of these factors. In Massachusetts, a study found strong evidence that natural nest cavities were in short supply and concluded that "...wood ducks can be maintained at a higher level of abundance with [nest boxes] than without them." Other studies have also reported increases in breeding populations due to the use of nest boxes. However, some evidence exists to suggest that an excessive number of nest boxes may be Detrimental to wood duck production. In California, a breeding population of wood ducks increased faster than the number of available nest sites. Over the course of the 9-year study, nest sites were gradually increased from 3 to 16 on a 11.3 ha (28 acres) marsh; an increase of breeding pairs from 3 to 35-40 occurred during the same period. At higher levels of pair density, the population became essentially self-limiting due to intraspecific competition for nest cavities, an increase in nest desertion and dump nesting (i.e., instances in which several hens lay eggs in the same nest site), and a resultant decrease in the production of young per pair. Nest interference is also common on sites with extensive habitat where food is abundant and nest sites are limited. However, several researchers have reported that dump-nesting resulted in a greater production of young. One researcher cautioned that crowded nesting conditions could be detrimental to wood duck production; they observed a wood duck hen call a brood from an adjacent nest box mounted on the same support pole and abandon incubation of her own clutch.